The Bioeconomy Consultants
NNFCC

Bio-based Products

News Review

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Each month we review the latest news and select key announcements and commentary from across the biobased chemicals and materials sector.

Contents

Foreword

Welcome, subscribers, to February's edition of NNFCC's Biobased Products News Review.

Within the biobased products sector, the past month has been very heavy on big policy news. Most significant among this has been the announcement of the EU's Europe-wide plastics strategy. Whilst not consisting in any concrete legislation yet, the strategy will influence future European policy decisions in favour of a more circular economy. The central tenet of the strategy is that all plastic packaging in Europe will be recyclable by 2030. Alongside this, there will be a push to reduce single-use plastics and microbeads. The implementation of such a strategy will require an overhaul of the entire plastic economy, shifting the focus at all stages of design and production to promoting reuse and recycling.

The response has, for the most part, been positive, as such a radical change to the plastics economy will hopefully reduce plastic waste drastically, and with it its environmental damage. However, this is not the only problem that stems from a plastic-based economy. The European Bioplastics Association (EUBP) highlights the lack of acknowledgement of feedstock use in plastic manufacture. The emphasis that the strategy places on mechanical recycling will not deter plastics manufacturers from using fossil fuels as feedstocks, whereas according to EUBP a proliferation of compostable plastics would encourage more sustainable feedstocks such as biomass. The strategy is not perfect, but is a good stepping stone, and its aforementioned status outside of official legislation means it is much more mutable than law.

Another policy decision that has proven to be more controversial, has been the proposition by the UK's Environment Audit Committee for a 25p surcharge on disposable coffee cups. This has already become colloquially known as the "latte levy", and has drawn ire from the public. The intentions behind the charges are to encourage recycling, but industry members are questioning why the burden has been placed on the public, when the industry itself is able to adapt in a more beneficial way. Again, one solution proposed is compostable plastics – these have already been developed and demonstrated in food packaging. By adjusting industry practice in this way, the greater availability of recyclable food packaging will happen naturally, and public attitudes will shift in a more positive way, rather than a negative response from having to pay extra for coffee as a result of the packaging used. Although relatively heavy-handed policies such as the "latte levy" have worked in the past (the classic example being the UK's 5p carrier bag charge), a more nuanced approach may be needed to bring wholesale change to the industry.

Read on for the latest news.

Policy

EU announces plastics strategy

The first-ever Europe-wide strategy on plastics is a part of the transition towards a more circular economy. It will protect the environment from plastic pollution whilst fostering growth and innovation, turning a challenge into a positive agenda for the Future of Europe. There is a strong business case for transforming the way products are designed, produced, used, and recycled in the EU and by taking the lead in this transition, we will create new investment opportunities and jobs. Under the new plans, all plastic packaging on the EU market will be recyclable by 2030, the consumption of single-use plastics will be reduced and the intentional use of microplastics will be restricted.

The plastic strategy will transform the way products are designed, produced, used, and recycled in the EU. Too often the way plastics are currently produced, used and discarded fail to capture the economic benefits of a more circular approach. It harms the environment. The goal is to protect the environment whilst at the same time lay foundations to a new plastic economy, where the design and production fully respect reuse, repair and recycling needs and more sustainable materials are developed.

With the plastic strategy, the Commission has adopted a Monitoring Framework, composed of a set of ten key indicators which cover each phase of the cycle, which will measure progress towards the transition to a circular economy at EU and national level.

Click here for more information.

EUBP welcomes European Plastics Strategy

The European Strategy for Plastics, published by the European Commission, sets clear goals to curb plastic waste, increase resource efficiency, and to create value and job growth in Europe, but falls short on presenting a comprehensive approach by limiting the focus of the strategy on mechanical recycling. Concrete steps towards reducing the dependency on fossil feedstock by linking the circular economy with the bioeconomy and supporting innovative bio-based plastics solutions have been further postponed. Moreover, the contributions of biodegradable plastics to a circular economy are recognised but concrete measures are still missing.

Replacing a significant proportion of the conventional fossil feedstock by plant-based alternatives would reduce greenhouse emissions and help to reach the UN Sustainable Development Goals and the Paris Agreement. At the same time, the mobilisation of EU-grown biomass for the production of bio-based plastics would provide impulses for jobs and growth in the bioeconomy sector and the opportunity to EU farmers to valorise side streams and by-products and to tap additional revenue streams.

EUBP welcomes the importance the Commission has given to biodegradable and compostable plastics and their role in separate collection systems for organic waste in order to improve clean waste streams and recycling quality. The benefits and circular use of biodegradable plastics have to be foremost considered in this context of organic recycling. EUBP looks forward to collaborating with the Commission on identifying applications and measures to stimulate innovation and drive market development in this field.

EUBP is looking forward to closely working together with the EU institutions and all relevant stakeholders in the upcoming discussions following the EU Plastics Strategy in order to ensure that the initial acknowledgements of alternative bio-based feedstocks and of biodegradable plastics will be further developed throughout the actions outline in the annex of the strategy.

Click here for more information.

Vegware highlights alternative options to "Latte Levy"

Pxhere

Vegware wholeheartedly supports any initiative that boosts recycling. The public and businesses are all eager for a solution. The UK Environmental Audit Committee has recommended a 25p 'latte levy' on any disposable coffee cup. Whilst the report raises many valid points about the challenges we face, Vegware does not see a 'latte levy' as the most effective way forward. Vegware supports the Foodservice Packaging Association's response, 'Why charge consumers 25 pence a cup when industry is willing to provide funding for recycling'. In addition, Vegware would like to highlight the opportunity that compostable packaging brings to recycling of all foodservice waste, not only cups.

In 2017 there were great strides in recycling used coffee cups by major chains and independents alike. Food contamination is cited in the report as a major issue. To complement cup and other dry recycling, industrial composting is a form of recycling with a major role to play here. If all disposables are compostable, all foodservice waste – the cup, lid, spoon and sandwich wedge, leftover crusts and mayo – can be composted together, and food contamination is no longer an issue.

Vegware takes its producer responsibility seriously and offers expert environmental support to help foodservice clients recycle used Vegware and food waste. Launched initially in Scotland in 2017, Vegware's Close the Loop service collects used compostables and food waste from Vegware clients, taking it for commercial composting. Now that they have a successful model to roll out, Vegware will be announcing good news in other areas of the UK in 2018.

To see a true shift in foodservice recycling and litter reduction, Vegware believes a comprehensive raft of improvements are needed to recycling systems and major public awareness campaigns. They welcome ambitious plans and are keen to drive innovation and collaboration in the packaging and recycling sectors.

Click here for more information.

Research & Development

Evonik and Siemens developing electrolysis & fermentation process

Evonik and Siemens are planning to use electricity from renewable sources and bacteria to convert carbon dioxide (CO_2) into specialty chemicals. The two companies are working on electrolysis and fermentation processes in a joint research project called Rheticus. The project is due to run for two years. The first test plant is scheduled to go on stream by 2021 at the Evonik facility in Marl, Germany which produces chemicals such as butanol and hexanol, both feedstocks for special plastics and food supplements, for example. The next stage could see a plant with a production capacity of up to 20,000 tonnes a year. There is also potential to manufacture other specialty chemicals or fuels. Some 20 scientists from the two companies are involved in the project.

The new technology combines multiple benefits. It not only enables chemicals to be produced sustainably, it also serves as an energy store, can respond to power fluctuations and help stabilize the grid. Rheticus is linked to the Kopernikus Initiative for the energy transition in Germany which is seeking new solutions to restructure the energy system. The Rheticus project will receive 2.8 million euros in funding from Germany's Federal Ministry of Education and Research.

Siemens and Evonik are each contributing their own core competencies to this research collaboration. Siemens is providing the electrolysis technology, which is used in the first step to convert carbon dioxide and water into hydrogen and carbon monoxide (CO) using electricity. Evonik is contributing the fermentation process, converting gases containing CO into useful products by metabolic processes with the aid of special micro-organisms. In the Rheticus project, these two steps – electrolysis and fermentation – are scaled up from the laboratory and combined in a technical test facility.

Click here for more information.

Polyurethanes from broccoli seeds

Pixabay

New biobased polyurethanes were synthesized from cyclocarbonated broccoli seed oil and different di- or triamines. The isocyanate-free route to synthesize these polyurethanes was divided into three steps: the broccoli seed oil was first epoxydized, then carbonated with CO_2 at a pressure of 50 bar to convert oxiranes into cyclic carbonates, and finally polyurethanes were prepared through the reaction of the cyclocarbonated oil with three different di- or triamines, that is, butylene diamine, m-xylene diamine, and bis(hexamethylene triamine). The chemical reactions were monitored by Fourier transform infrared spectroscopy, nuclear magnetic resonance, and electrospray ionisation mass spectrometry and mechanical properties of thus-prepared polyurethanes were determined by dynamic mechanical analysis and tensile characterization. An UV-responsive material was finally prepared from butylene diamine-based polyurethane integrating phosphorescent molybdenum nanoclusters.

Click here for more information.

Novel process for FDCA from fructose

This paper reports a process for converting fructose, at a high concentration (15 weight %), to 2,5-furandicarboxylic acid (FDCA), a monomer used in the production of polyethylene furanoate, a renewable plastic. In the process, fructose is dehydrated to hydroxymethylfurfural (HMF) at high yields (70%) using a γ-valerolactone (GVL)/H_2O solvent system. HMF is subsequently oxidized to FDCA over a Pt/C catalyst with 93% yield. The advantage of this system is the higher solubility of FDCA in GVL/H_2O, which allows oxidation at high concentrations using a heterogeneous catalyst that eliminates the need for a homogeneous base. In addition, FDCA can be separated from the GVL/H_2O solvent system by crystallization to obtain >99% pure FDCA. The process eliminates the use of corrosive acids, because FDCA is an effective catalyst for fructose dehydration, leading to improved economic and environmental impact of the process. The accompanying techno-economic model indicates that the overall process is economically competitive with current terephthalic acid processes.

Click here for more information.

Polymers

Impacts of oxo-degradable plastics

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The European Commission has published a report assessing the impacts of oxo-degradable plastics.

Taking into consideration the key findings of the supporting study as well as other available reports, there is no conclusive evidence on a number of important issues relating to beneficial effects of oxo-degradable plastic on the environment. It is undisputed that oxo-degradable plastic, including plastic carrier bags, may degrade quicker in the open environment than conventional plastic. However, there is no evidence that oxo-degradable plastic will subsequently fully biodegrade in a reasonable time in the open environment, on landfills or in the marine environment. Sufficiently quick biodegradation is in particular not demonstrated for landfills and the marine environment. A wide range of scientists, international and governmental institutions, testing laboratories, trade associations of plastics manufacturers, recyclers and other experts have therefore come to the conclusion that oxo-degradable plastics are not a solution for the environment and that oxo-degradable plastic is not suited for long-term use, recycling or composting. There is a considerable risk that fragmented plastics will not fully biodegrade and a subsequent risk of an accelerated and accumulating amount of microplastics in the environment, especially the marine environment. The issue of microplastics is long acknowledged as a global problem in need of urgent action, not just in terms of clean-up of littering but also of plastic pollution prevention. Claims presenting oxo-degradable plastic as an "oxo-biodegradable" solution to littering which has no negative impact on the environment, in particular by not leaving any fragments of plastic or toxic residues behind, are not substantiated by evidence. In the absence of conclusive evidence of a beneficial effect on the environment and indeed indications to the contrary, given the related misleading claims to consumers and risks of resulting littering behaviour, EU wide measures should be considered. Therefore, in the context of the European plastics strategy, a process to restrict the use of oxo-plastics in the EU will be started.

Click here for more information.

Extended PEF pilot for Synvina

Avantium N.V. announced that Synvina, its joint venture with BASF, plans to extend the pilot phase in order to optimize future commercial-scale production. This will lead to a startup-delay of the Reference Plant by 24 to 36 months.

Synvina has now completed a broad feasibility assessment for commercial-scale production of FDCA (furandicarboxylic acid) in its Reference Plant intended to be built in Antwerp. FDCA is the main building block for the new polymer PEF (polyethylenefuranoate). The assessment looked at product performance, market appetite and technical process.

The assessment confirmed that product performance and customer demand are strong. In the technical process evaluation, Synvina identified some steps that require improvement. It recommends undertaking additional development work on these steps, to ensure the most efficient process and best product for current and future customers. As a result, Synvina intends to extend the pilot phase.

Click here for more information.

Synvina

Chemicals

BioAmber's succinic acid performs well in animal feed

BioAmber Inc., a leader in renewable materials, is pleased to announce the results of an independent commercial trial conducted with a leading North American feed formulator, on the effectiveness of BioAmber's Bio-Succinic Acid, BIO-SA™, as an ingredient in Animal Feed for nursery pigs.

In a commercial study co-sponsored by BioAmber, BIO-SA™ feed supplementation demonstrated substantial benefits towards the growth performance and gut health in nursery pigs under dietary and environmental challenges. Specifically, the addition of bio-succinic acid to feed resulted in material increases in the average daily weight gain of nursery pigs. In another series of studies, in vitro tests have confirmed that BIO-SA™ exhibits antimicrobial activity against certain microorganisms at lower concentrations than other organic acids. Results obtained by BioAmber indicate that BIO-SA™ in feed additives could improve overall growth performance and reduce detrimental animal health conditions.

Succinic acid is listed by The Association of American Feed Control Officials (AAFCO) and the European Union Register of Feed Additives, for immediate use in animal feed formulations.

Click here for more information.

First bio-isobutene bottles unveiled

Pixabay

Butagaz, one of the leading multi-energy companies in France, and Global Bioenergies present a preview of their first bottles containing bio-isobutene, a bio-sourced gas.

The supply of this bio-sourced gas, which will be distributed for the first time in France in an Intermarché point of sale, is a first and decisive step towards furthering the aim of contributing to meeting France's greenhouse gas emissions reduction target by driving innovation. Incorporating bio-isobutene in Butagaz's butane and propane gas bottles reduces CO_2 emissions by up to 40%* over the entire life cycle of the bottled gas.

Butagaz, a leading French multi-energy company, distributes natural gas, electricity, wood pellets, as well as – naturally – propane and butane gas (these gases are amongst the cleanest forms of fossil fuel**). To achieve its aim of reducing the carbon footprint of its propane and butane value chains even further, the Butagaz group signed an exclusive partnership deal in France with Global Bioenergies (see press release dated 16 January 2017), a pioneering French company developing a process to convert renewable resources, such as sugar beet, into hydrocarbons through fermentation. Butagaz is contributing financially to Global Bioenergies' industrial development in return for reserved batches of bio-isobutene, whose physical and chemical properties are close to those of butane and propane.

Less than one year old, the partnership has already yielded its initial fruits with the first gas bottles containing between 10 and 15% bio-isobutene. A remarkable first! These batches of bio-isobutene were produced by Global Bioenergies' demo plant at Leuna in Germany.

This breakthrough is only the beginning. In the long term, Butagaz will have the potential to purchase large quantities of "made in France" bio-isobutene when the first Global Bioenergies' plant comes on stream at a sugar producer Cristal Union's site in Champagne. This bio-isobutene can then be incorporated in Butagaz's bottles or tanks of butane and propane, generating CO_2 savings of up to 40%* on a large scale throughout the gas life cycle.

Click here for more information.

Aquafil and Genomatica to produce biobased nylon ingredient

Aquafil and Genomatica have announced a multiyear agreement to create sustainable caprolactam, a key ingredient to producing 100 percent sustainable nylon. The collaboration aims to develop a commercially-advantageous bioprocess (Genomatica's GENO CPL™ process) to make caprolactam using plant-based renewable ingredients, rather than the crude oil-derived materials traditionally used by the nylon industry.

Used in a variety of nylon-based products including carpets and apparel, caprolactam has a worldwide market of over five million tons per year. Genomatica's GENO CPL™ process aims to provide an environmentally-friendly way to make caprolactam with better economics, including for smaller-scale plants. Additionally, it will enable licensees and their customers to differentiate themselves by offering a more sustainable bio-based product whose performance will be fully comparable with nylon made from crude oil-derived caprolactam, and which will not require any machine or process adjustments by the nylon supply chain. Genomatica is the licensor of the GENO CPLTM process.

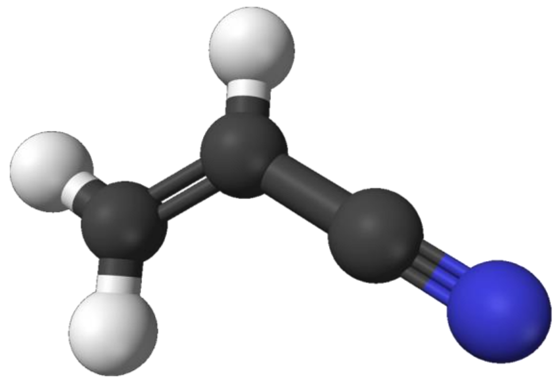
Genomatica's process to make biobased caprolactam aims to let Aquafil and others make more sustainable nylon apparel, carpets and fibres.

Click here for more information.

Process for producing Acrylonitrile from sugar

Acrylonitrile (ACN) is a petroleum-derived compound used in resins, polymers, acrylics, and carbon fibre. This paper presents a process for renewable ACN production using 3-hydroxypropionic acid (3-HP), which can be produced microbially from sugars. The process achieves ACN molar yields exceeding 90% from ethyl 3-hydroxypropanoate (ethyl 3-HP) via dehydration and nitrilation with ammonia over an inexpensive titanium dioxide solid acid catalyst. It further describes an integrated process modelled at scale that is based on this chemistry and achieves near-quantitative ACN yields (98 ± 2%) from ethyl acrylate. This endothermic approach eliminates runaway reaction hazards and achieves higher yields than the standard propylene ammoxidation process. Avoidance of hydrogen cyanide as a by-product also improves process safety and mitigates product handling requirements.

Click here for more information.



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Anellotech receives investment for biobased aromatics

Anellotech, a sustainable technology company pioneering the production of cost-competitive renewable chemicals and fuels from non-food biomass, has announced that Japan-based Suntory Holdings Limited, one of the world's leading consumer beverage companies, has invested an additional $9 million in Anellotech's Bio-TCat technology. This latest tranche, which is part of a new $15 million package based on Anellotech achieving specific milestones, brings Suntory's total investment in Anellotech to more than $25 million to date.

Anellotech's Bio-TCat Process will produce cost-competitive renewable aromatic chemicals from non-food biomass for use in manufacturing plastics such as polyester, nylon, polycarbonate, polystyrene, or for renewable transportation fuels. Anellotech recently announced the completion of the commissioning of its 25-metre-tall TCat-8 pilot plant, and has commenced the critical development program to validate process economics and obtain necessary data for commercial plant design.

The alliance with Suntory, one of Anellotech's principal strategic investment partners, began in 2012 with the goal of enabling the development and commercialization of cost-competitive 100 percent bio-based plastics for use in beverage bottles. Suntory currently uses 30 percent plant-derived materials for its Mineral Water Suntory Tennensui brands and is pursuing the development of a 100 percent bio-based PET bottle through this alliance, as part of its commitment to sustainable business practices.

Click here for more information.

Consumer Products

Developing a sustainable denim dyeing process

Max Pixel

Indigo is an ancient dye uniquely capable of producing the signature tones in blue denim; however, the dyeing process requires chemical steps that are environmentally damaging. This paper describes a sustainable dyeing strategy that not only circumvents the use of toxic reagents for indigo chemical synthesis but also removes the need for a reducing agent for dye solubilization. This strategy utilizes a glucose moiety as a biochemical protecting group to stabilize the reactive indigo precursor indoxyl to form indican, preventing spontaneous oxidation to crystalline indigo during microbial fermentation. Application of a β-glucosidase removes the protecting group from indican, resulting in indigo crystal formation in the cotton fibres. They identified the gene coding for the glucosyltransferase PtUGT1 from the indigo plant Polygonum tinctorium and solved the structure of PtUGT1. Heterologous expression of PtUGT1 in Escherichia coli supported high indican conversion, and biosynthesized indican was used to dye cotton swatches and a garment.

Click here for more information.

Clariant and Global Bioenergies release cosmetics polymer

Global Bioenergies, a leader in industrial biotechnology and Clariant, a world leader in specialty chemicals, announced the development of a new bio-based polymer for cosmetic creams and lotions, which is derived from renewable isobutene.

Developed with Global Bioenergies' sugar-based isobutene, Clariant's new ingredient is a rheology modifier that influences formulation viscosity and achieves specific sensorial and texturizing properties for creams and lotions. It contains more than 50% renewable carbon, and consequently meets the ISO 16128:2016 standard for natural and organic cosmetic ingredients and products.

The bio-based polymer is a breakthrough for the industry as it is proven not to change the properties of an application, offering formulators a direct 1:1 alternative to petroleum-based equivalents.

The building block of Clariant's new cosmetics ingredient is currently produced on a small scale at Global Bioenergies' demo plant located in Leuna, Germany. The companies are working on upscaling production with larger volumes.

Click here for more information.

Patents

Genetically Modified Phenylpyruvate Decarboxylase, processes to preare, and uses thereof

Modification of the amino acid sequence of a phenylpyruvate decarboxylase from Azospirillum brasilense produces a novel group of phenylpyruvate decarboxylases with improved specificity to certain substrates, including in particular C7-C11 2-ketoacids such as, for example, 2-ketononanoate and 2-keto-octanoate. This specificity enables effective use of the phenylpyruvate decarboxylase in, for example, an in vivo process wherein 2-ketobutyrate or 2-ketoisovalerate are converted to C7-C11 2-ketoacids, and the novel phenylpyruvate decarboxylase converts the C7-C11 2-ketoacid to a C6-C10 aldehyde having one less carbon than the 2-ketoacid. Ultimately, through contact with additional enzymes, such C6-C10 aldehydes may be converted to, for example, C6-C10 alcohols, C6-C10 carboxylic acids, C6-C10 alkanes, and other derivatives. Use of the novel genetically modified phenylpyruvate de carboxylases may represent a lower cost alternative to non-biobased approaches.

Click here for more information.

Methods for production of Terephthalic Acid from Ethylene Oxide

The present invention provides methods for the production of terephthalic acid and derivatives thereof using ethylene oxide, carbon monoxide and furan as feedstocks. The process is characterized by high yields and high carbon efficiency. The process can utilize 100% biobased feedstocks (EO via ethanol, CO via biomass gasification, and furan via known processes from cellulosic feedstocks).

Click here for more information.

Biobased production of Functionalised Alpha-Substituted Acrylates and C4-Dicarboxylates

The description relates to, inter alia, recombinant microorganisms, engineered metabolic pathways, chemical catalysts, and products produced through the use of the described methods and materials. The products produced include functionalized alpha substituted C4 dicarboxylic acids, as well as functionalized malonyl-CoA, malonic semialdehyde, and acrylic acids, and their salts, esters and lactones.

Click here for more information.

Events

ECO-BIO 2018
4th-7th March 2017

ECO-BIO 2018 will highlight the latest research and innovation towards developing industrially viable, safe and ecologically friendly biobased solutions to build a sustainable society.

The conference will bring together all concerned with the biobased economy to review industrial, academic, environment and societal approaches, discuss the latest research and progress, and encourage new research partnerships to enable new cascaded biobased value chains.

Click here for more information.

BIOKET
Strasbourg, 6th-8th March 2018

Biomass is a wonderful resource to be transformed into chemicals, biobased materials, food and feed ingredients or energy. Still, adaptation and optimisation of transformation processes and technologies is a real challenge in order to valorise all biomass fraction in a circular approach.

In the context of Industry 4.0, Key Enabling Technologies (KETs) provide the basis for innovation in a range of products across all industrial sectors. They underpin the shift to a greener economy, are instrumental in modernizing industrial base, and drive the development of entirely new industries. BIOKET, the BIOeconomy's Key Enabling Technologies conference aims to contribute to the rise of KETs by promoting emerging KETs applied in the Bioeconomy's sector.

Click here for more information.

World Bio Markets
Amsterdam, 20th-22nd March 2018

With governments committed to reducing emissions and consumers becoming more educated about where their products come from, there are opportunities for the bio-based sector to become a true contender to fossil oil. Yet long development times, lack of investment, and challenges in attaining a secure and sustainable supply chain have made it difficult for the bio-economy to achieve commercial success.

This event provides a platform for the entire global value chain, from feedstock producers to consumer brands, to work together to overcome these challenges.

Click here for more information.

Global Bioeconomy Summit 2018
Berlin, 19th-20th April 2018

The first Global Bioeconomy Summit was held in 2015 and brought together more than 700 bioeconomy stakeholders from over 80 countries. Since then, Bioeconomy has taken a steep and exciting way forward. Many notable initiatives and collaborative efforts have been initiated by the bioeconomy community in order to drive the development of sustainable bioeconomies in their countries and regions.

The 2nd GBS will focus on emerging concepts and future trends in bioeconomy, the latest on challenges and opportunities related to ecosystems, climate action and sustainable development along with the bioeconomy innovation agendas and global governance initiatives to manage them.

Click here for more information.

EUBCE
Copenhagen, 14th-18th May 2018

We look forward to the 26th EUBCE in 2018 in Denmark and to the many vibrant topics that will be included in the agenda. The core of the traditional EUBCE conference will be held over 4 days.

There will however be an extension to the core conference and exhibition in order to showcase the many achievements in the field of full scale biomass utilisation in Denmark that are an integral and major part of the country becoming fossil-free by 2050. Members of the national organising committee will organise special technical visits to sites in the centre of the country where biomass is the key renewable feedstock into processes producing renewable energy, biofuels, biochemicals and biomaterials as well as integrating bioproducts into traditional established fossil-based systems.

Click here for more information.

International Conference on Bio-based Materials
Köln, 15th-16th May 2018

The 11th International Conference on Bio-based Materials is aimed at providing international major players from the bio-based building blocks, polymers and industrial biotechnology industries with an opportunity to present and discuss their latest developments and strategies.

Click here for more information.

RRB 14
Ghent, 30th May - 1st June 2018

The 14th edition of the International Conference on Renewable Resources & Biorefineries will take place in Ghent, Belgium from Wednesday 30 May until Friday 1 June 2018. Based on the previous RRB conferences, this conference is expected to welcome about 350 international participants from over 30 countries.

The three-day international conference will consist of plenary lectures, oral presentations, poster sessions and an exhibition. Companies and research organizations are offered the opportunity to organize a satellite symposium.

Click here for more information.

1st PHA Platform World Congress
Köln, 4th-5th September 2018

This PHA-platform is made up of a large variety of bioplastics raw materials made from many different renewable resources. Depending on the type of PHA, they can be used for applications in films and rigid packaging, biomedical applications, automotive, consumer electronics, appliances, toys, glues, adhesives, paints, coatings, fibres for woven and non-woven and inks. So PHAs cover a broad range of properties and applications.

This congress will address the progress, challenges and market opportunities for the formation of this new polymer platform in the world. Every step in the value chain will be addressed. Raw materials, polymer manufacturing, compounding, polymer processing, applications, opportunities and after-use or end-of-life options will be discussed by parties active in each of these areas. Progress in underlying technology challenges will also be addressed.

Click here for more information.

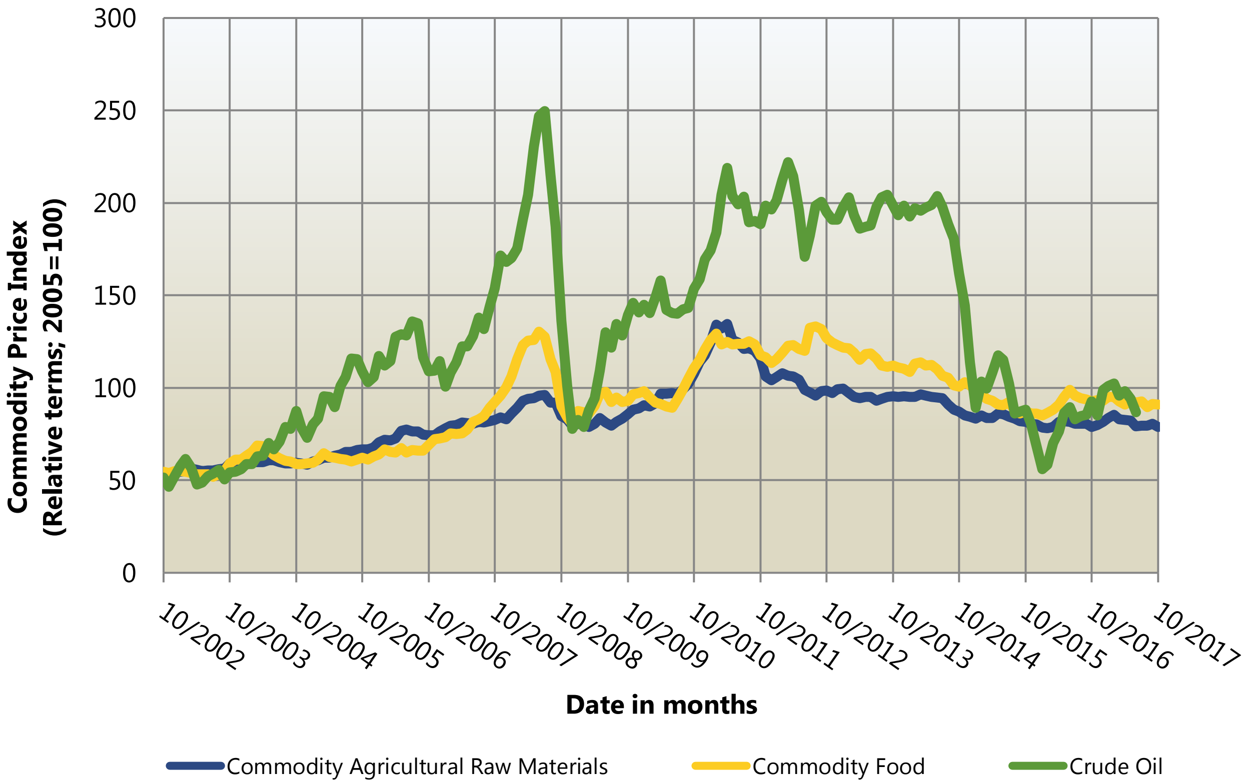
Price Information

Spot Prices of feedstocks as of today and five years ago, and percentile price change. Arrows indicate rise (↑), constant (–) or fall (↓) from previous month.

Item	Price, US$ (Dec 12)	Price, US$ (Dec 17)	Price Change
Crude oil (petroleum, barrel)	101.19	61.19	-40%
Maize (corn, metric ton)	308.65	148.98	-52%
Sugar (pound)	0.43	0.32	-26%
Rapeseed oil (metric ton)	1,190.00	873.67	-27%
Soybean oil (metric ton)	1,163.00	861.67	-26%
Ethanol (gallon)	2.37	0.95	-60%

For details on indexes please see www.indexmundi.com/commodities; Ethanol prices from Govt of Nebraska at www.neo.ne.gov/;

Raw materials 15-year Price Indices



For details on the nature of these commodities please see www.indexmundi.com/commodities

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